

REMARKS

Summary of Amendments

1. Claims 1 through 16 were originally presented in this application. Claims 17 through 20 were added by an amendment dated November 1, 2004, in response to the first Office action on the merits in the original examination. In response to a second action in the original examination of this application, claims 3 and 7 were canceled without prejudice by an amendment dated March 30, 2005. In response to the final Office action in the original examination, claims 1, 9, 11, and 15 were canceled without prejudice in an amendment that was entered upon Applicants' filing a Request for Continued Examination dated December 5, 2005. Then, in an amendment dated June 23, 2006 in response to the first action on the merits in the continued prosecution of this case, Claims 21, 22, and 23 were added.
2. By the present amendment, which is an RCE-accompanying submission in response to the latest, final Office action in the continued prosecution, claim 24 has been added. Claims 18, 21, and 22 have been canceled. Claims 4, 5, 17, 19, and 20 have been amended, as detailed below, to more particularly point out and distinctly claim the inventive material of the instant invention.
3. Accordingly, claims 2, 4-6, 8, 10, 12-14, 16, 17, 19, 20, 23 and 24 are now pending.
4. Applicants' representative wishes to thank Examiner Turner for the telephonic interview of October 30, 2006. An interview summary on Applicants' behalf, pursuant to 37 C.F.R. § 1.133(b), is submitted herewith.

Claim Rejections – 35 U.S.C. § 102

5. Claims 5, 6, 8, 13, 14, 16, 19, 20, 22, and 23 stand rejected under 35 U.S.C. § 102(b) as being anticipated by *Hakovirta* ("Hardmetal woodcutting tool tips coated with a tetrahedral amorphous carbon," *Diamond and Related Materials* 8, 1999, 1225-1228). In particular, the Examiner states: "Harovirta discloses the claimed carbon coating with the claimed thickness and compressive stress on the claimed substrate having the claimed grain size."
6. Applicants respectfully traverse this rejection to the extent that it is pertinent to independent claim 5, as amended. Claim 5 has been amended to add two additional limitations:

the hard carbon thin film consists of a single layer deposited on the cemented-carbide base material such that substantially the entire hard carbon thin film is in direct contact with the cemented-carbide base material, and
a concentration of cobalt at the cutting surface of the cemented carbide base material is substantially equal to the bulk cobalt concentration.

Applicants respectfully submit that these new limitations are supported by the original specification, claims, and drawings. The first new limitation is supported, for example, by paragraph [0044], which states in part that the "hard carbon thin film" is formed "on the surface of a foregoing WC-based cemented-carbide router cutter." The second new limitation is implicit in the original specification in that there is no disclosure of any etching or surface modification treatments to create a cobalt-depleted zone at the surface of the cemented carbide. Absent any such treatments, the cobalt concentration at the cutting surface would be substantially equal to the bulk cobalt concentration (as recited in the amendment).

7. Applicants respectfully submit that amended claim 5 is now distinct from *Hakovirta* for several reasons. First, amended claim 5 now teaches a "hard carbon thin film consist[ing] of a single layer deposited on the cemented-carbide base material." Such claim language explicitly disclaims (i) structures including intermediate layers disposed between the carbon film and the cemented carbide, and (ii) structures including multiple carbon film layers. In contrast, *Hakovirta* discloses an intermediate and multi-layer structure (Fig. 1). The intermediate layer includes a chromium layer disposed between the carbon layer and the cemented carbide. The multi-layer structure includes multiple, alternating chromium and carbon layers.
8. Moreover, amended claim 5 now also recites that the cobalt concentration at the cutting surface of the cemented carbide is substantially equal to the bulk cobalt concentration in the cemented carbide. This is also distinct from *Hakovirta*, which discloses the use of a one-hour physical etching (sputtering) procedure (left-hand column on page 1226) to promote adhesion of the carbon film. While *Hakovirta* does not explicitly state that the "etching procedure" results in a "cobalt-depleted surface zone," it is common knowledge in the art (see the introduction section of U.S. Pat. No. 5,952,102, which is of record in this case) that such cobalt-depleted surface zones are necessary to promote adhesion of hard carbon films to cemented carbide substrates. Advantageously, and in contrast to conventional wisdom, no such "cobalt-depleted zone" is used or required in the instant invention. Accordingly, Applicants respectfully submit that amended claim 5 is now allowable.

9. Applicants also respectfully traverse the presently addressed § 102(b) rejection to the extent that it is pertinent to independent claim 19, as amended. Claim 19 has been amended to include narrower film-thickness and compressive-stress ranges. In particular, the upper limit on the film thickness has been amended down from 3 to 0.2 μm . The upper limit on the compressive stress has been amended down from 8 to 1 GPa. These amendments are supported by Example 26 in Table II of the original specification.
10. Applicants respectfully submit that amended claim 19 is now distinct from the prior art of record. *Hakovirta* discloses tetrahedral amorphous carbon (ta-C) film thicknesses of 0.9 and 1.2 μm , which is well outside the range now recited in amended claim 19. Moreover, *Hakovirta* makes no disclosure of a carbon film having a low compressive stress (in the range from 0.1 to 1 GPa). On the contrary, *Hakovirta* explains that the carbon films taught therein have "extreme internal compressive stress . . . which can be as high as 8.5 GPa." Again, there is no disclosure or suggestion in *Hakovirta* of a hard-carbon film having a thickness in the claim-19 recited range or with the claim-19 recited compressive stress. Applicants therefore submit that amended claim 19 is now patentable over the prior art of record.
11. Applicants further respectfully traverse the presently addressed § 102(b) rejection to the extent that it is pertinent to independent claim 20, as amended. Claim 20 has been amended to include the new limitations added to claim 5 (described above in Section 6) and the narrower thickness and compressive stress ranges of claim 19 (described above in Section 9). Accordingly, Applicants submit that the amendments to claim 20 are fully supported by the original disclosure. Applicants also submit that claim 20 is allowable over the prior art of record for the same reasons as presented above in Paragraphs 7, 8, and 10 with regard to claims 5 and 19.

Claim Rejections – Double Patenting

12. Claims 5, 6, 8, 13, 14, 16, 19, 20, 22, and 23 also stand rejected on the ground of nonstatutory double patenting over claims 1, 7, and 9 of U.S. Patent 6,881,475. In particular, the Examiner states:

the subject matter claimed in the instant application is fully disclosed in the patent and is covered by the patent[,] since the patent and the application are claiming common subject matter, as follows: the stress value is an inherent in the disclosed coating of the patent.
13. Applicants respectfully submit that independent claims 5, 19, and 20, amended as described above, are now patentably distinct from U.S. Patent 6,881,475, since the amended claims explicitly disclaim any intermediate layers.

14. For the reasons just given, Applicants submit that independent claims 5, 19, and 20, as amended, are now patentable over the prior art of record, and therefore that the rejection under this section has been rendered moot. Independent claim 5 being allowable, it follows that dependent claims 6, 8, 13, 14, 16, and 23 must also be allowable.

Claim Rejections – 35 U.S.C. § 103

15. Claims 2, 4, 10, 12, and 21 stand rejected under U.S.C. § 103(a) as being unpatentable over *Nakamura et al.* (U.S. Pat. No. 6,565,957) in view of *Moriguchi et al.* (U.S. Pat. No. 5,776,588), in further view of *Oskarsson* (U.S. Pat. No. 6,228,139). While claims 17 and 18 were not explicitly rejected in the Office action, it is assumed that the Examiner intended to reject those claims on the same grounds. With respect to the surface-roughness limitation in independent claims 4, 17, and 18, the Examiner states:

[T]he limitation of the roughness being as-deposited is a process limitation which does not contact the final product. How the roughness is produced is not of consequence here. Thus it would have been obvious to one of ordinary skill in the art to remove the alumina layer in *Nakamura et al.* as suggested by *Moriguchi et al.* to reveal the disclosed invention.

16. Applicants respectfully traverse this rejection to the extent that it is pertinent to independent claim 4 as amended. Claim 4 has been amended to replace the "comprising" language of the previously presented version of the claim to "consisting of" language as recommended by the Examiner in the October 30, 2006 telephonic interview. Claim 4 also now recites "a machining-tool shank having a blade portion, the blade portion fabricated from a cemented-carbide base material." Amended claim 4 is supported by previously presented claim 4 as well as by the original specification, for example in Paragraphs [0040] and [0041].
17. Applicant respectfully submits that amended claim 4 is now patentable over the prior art of record. Amended claim 4 distinguishes over *Nakamura et al.* in that it recites only a single-layer compound thin film. By using "consisting of" language, amended claim 4 also disclaims all other thin film layers of any kind (including the alumina layer in *Nakamura et al.*). Applicants therefore submit that amended claim 4 is patentable over *Nakamura et al.*
18. Further by the present amendments, subject matter recited in claim 4 has been rewritten into method claim (new claim 24), as also suggested by the examiner in the October 30, 2006 telephonic interview. Applicants respectfully submit that new claim 24 is supported by previously presented claim 4. It is further submitted

that new claim 24 is patentable over the prior art of record in that it recites a vapor deposition process predetermined so as to impart "an as-deposited surface roughness of 0.01 μm or more and less than 0.3 μm by indication Ra." As discussed at length in Sections 12, 13, and 14 of Applicants' reply of June 23, 2006, there is no disclosure in the prior art of record of a compound thin film having an "as-deposited" surface roughness in the recited range (nor is there any disclosure of a process for fabricating such a film). On the contrary, as also discussed in the June 23, 2006 reply, the prior art of record discloses various surface modification techniques, such as sand-blasting and polishing, to achieve surface roughness values in the recited range. Accordingly, Applicant submit that new method claim 24 is patentable over the prior art of record.

19. The amendments to previously independent claim 17 render the claim properly dependent on new claim 24; thus claim 17 should now also be allowable. Previously presented independent claim 18 has been canceled.
20. For the reasons set forth above, Applicants submit that independent claims 4 and 24, as amended and added, are now patentable over the prior art of record. Independent claims 4 and 24 being allowable, it follows that dependant claims 2, 10, 12, and 17 must also be allowable.

Accordingly, Applicant courteously urges that this application is in condition for allowance. Reconsideration and withdrawal of the rejections is requested. Favorable action by the Examiner at an early date is solicited.

Respectfully submitted,

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